

11. (Amended) A microdot mark shape which is formed by a laser beam, on a surface of an article to be marked, which is a wafer, by using a laser as a light source, wherein the microdot mark shape is made by one dot mark formed on each laser irradiated point, the mark has a protrusion which protrudes in the center portion upward from the surface of the article to be marked, the length of each dot mark along the surface of the article to be marked is 1.0 to 15.0 μm , and the dot mark is formed for product management or various securities.

REMARKS

The Office Action was issued on pending claims 1-11. Applicants note that the Office Action Summary only refers to claims 1-10; however, the Detailed Action refers to claims 1-11. Claims 3-6 stand allowed and claims 1, 2, and 7-11 stand rejected. In this Response, claims 1 and 11 have been amended, claim 2 has been cancelled, and no claims have been added. Thus, claims 1 and 3-11 are pending in the application.

Allowable Subject Matter

In Office Action paragraph 8, claims 3-6 were noted as being allowed. Applicants thank the Examiner for this notice of allowed claims.

Double Patenting

In Office Action paragraph 1, claims 1, 2, 7, and 9-11 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,347,454 B1. Applicants respectfully disagree.

Initially, U.S. Patent No. 6,347,454 B1 is assigned to a different assignee than the present application, and pertains to an entirely different invention (vehicle bed edge manufacturing process) than the present application. Thus, Applicants submit that the obviousness-type double patenting rejection is improper.

If the Office Action meant to base this rejection on U.S. Patent No. 6,437,454 (the '454 patent), Applicants respond as follows.

The term of a patent issuing from the present application will not extend beyond the term of the '454 patent. The filing date of the present application is earlier than the filing date of the application which issued as the '454 patent. Specifically, the filing date of the present application is May 23, 2000 and the present application is a continuation-in-part of parent application serial number 09/448,127, filed November 24, 1999. The filing date of the application which issued as the '454 patent is October 13, 2000. Both the present application and the '454 patent are subject to patent terms of twenty years from their filing dates. Accordingly, a twenty-year term for a patent issuing from the present application will expire prior to the twenty-year term of the '454 patent. Thus, for this reason alone, a non-statutory obviousness-type double patenting rejection is improper and Applicants request that it be withdrawn.

Applicants reserve the right to further address the non-statutory obviousness-type double patenting rejection, including but not limited to, filing a terminal disclaimer in a future response if the double patenting rejection is maintained.

In Office Action paragraph 2, claims 1, 2, and 9-11 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 6 of U.S. Patent No. 6,436,842 B2. Applicants respectfully disagree.

The term of a patent issuing from the present application will not extend beyond the term of the '842 patent. The filing date of the present application is earlier than the filing date of the application which issued as the '842 patent. Specifically, the filing date of the present application is May 23, 2000 and the present application is a continuation-in-part of parent application serial number 09/448,127, filed November 24, 1999. The filing date of the application which issued as the '842 patent is February 2, 2001. Both the present application and the '842 patent are subject to patent terms of twenty years from their filing dates. Accordingly, a twenty-year term for a patent issuing from the present application will expire prior to the twenty-year term of the '842 patent. Thus, for this reason alone, a non-statutory obviousness-type double patenting rejection is improper and Applicants request that it be withdrawn.

Applicants reserve the right to further address the non-statutory obviousness-type double patenting rejection, including but not limited to, filing a terminal disclaimer in a future response if the double patenting rejection is maintained.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 10, and 11

In Office Action paragraph 3, claims 1, 10, and 11 were rejected under 35 U.S.C. § 102(b) as being anticipated by Haddock et al. (U.S. 4,818,852). Applicant's respectfully disagree.

Haddock et al. pertains to a method for forming data cards in which machine readable data are recorded. The data consist of spots 229 recorded by a laser. The spots 229 are, however, formed on a laser recording tape, which consists of a Mylar substrate 83 which is coated with a very thin metal layer 85, over which an emulsion layer 87 is disposed and covered by transparent coating 93. Haddock et al., Fig. 3, column 4, lines 10-31; Figs. 11, 12, 12a and column 9, lines 20-22 and column 11, lines 6-20. Therefore, the spots of Haddock et al. are not formed on a wafer as claimed in claims 1 and 11.

Further, the Office Action asserts that the Haddock et al. mark is formed as a layer (citing column 9, lines 1-17) and may serve as a stop means, it is presumed to have height or form a protrusion (citing column 10, lines 4-61). However, the stop marks 219, 221 of Haddock et al. are a series of lines rather than dots. Haddock et al., Figs. 12 and 12a, column 10, lines 27-30. Haddock et al. does not disclose a particular shape of each spot 229. That is, Haddock et al. does not describe any shape of a dot mark in which "the mark has a protrusion which protrudes in the center portion upward from the surface of the article to be marked" as claimed in claims 1 and 11 of the present invention.

While Haddock et al. describes the spot 229 as having a particular size, Haddock et al. does not disclose a mark having a protrusion which protrudes in the center portion upward from the surface of the article to be marked. Therefore, Haddock et al. does not disclose a dot mark shape having excellent visibility that can be realized even by a single dot mark, for which the present invention can provide. Accordingly, the present invention can provide advantages over Haddock et al.

Accordingly, claims 1 and 11 of the present application are patentable over Haddock et al. Dependent claim 10 is also allowable at least for the reasons above regarding independent claim 1 and because of its dependency upon independent claim 1. Thus, Applicants submit the §102 rejection has been overcome.

Claims 1, 7, 8, 10, and 11

In Office Action paragraph 4, claims 1, 7, 8, 10, and 11 were rejected under 35 U.S.C. § 102(e) as being anticipated by O'Dell et al. (U.S. 6,068,891). Applicants respectfully disagree.

O'Dell pertains to a method for forming bumps 12 on a glass ceramic substrate 10 of a magnetic disk in a process for texturing a surface of the substrate by a CO₂ laser. However, O'Dell does not disclose or suggest that the bumps be applied to a semiconductor wafer as claimed in claims 1 and 11.

In O'Dell, the bumps are formed on a glass ceramic substrate of a magnetic disk by the CO₂ laser. But, the pulse duration (width) of the laser which is described in O'Dell is 1000ns or 5000ns, which is far greater than that of the present invention (50ns in an embodiment). Thus, it is apparent that the dot mark shape of the present invention according to claims 1 and 11 and the bump shape of O'Dell are quite different because of the different formation processes.

Further, the bumps of O'Dell are formed for the purpose of reducing stiction and friction between a read-write head and a disk during CSS ("contact start stop") operation. O'Dell, column 1, lines 21-24 and lines 55-56. The O'Dell bumps should be as smooth as possible. O'Dell, column 1, lines 37-43. Therefore, it is apparent that the O'Dell bump does not function as a mark having excellent visibility that can be realized even by a single dot mark.

Thus, the present invention according to claims 1 and 11 is different from O'Dell in terms of structure, object, and effect. Accordingly, claims 1 and 11 of the present application are patentable over O'Dell. Dependent claims 7, 8, and 10 are also allowable at least for the reasons above regarding independent claim 1 and because of their dependency upon independent claim 1. Thus, Applicants submit the § 102 rejection has been overcome.

Claim Rejections – 35 U.S.C. § 103

Claims 1, 2, and 8-11

In Office Action paragraph 6, Claims 1, 2, and 8-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kruger (U.S. 4,847,183). Applicants respectfully disagree.

Kruger pertains to formation of mesas on a wafer. The Office Action acknowledges that the mesas are not formed by a laser. Instead, the mesas are formed by chemical etching (wet etching). Although the Office Action asserts that the method of forming the dot does not further limit the structure of the dot or give it different properties or a different shape, the mesa in

Kruger is actually different in structure from the peculiar shape of the dot mark according to claims 1 and 11 of this application.

The Office Action asserts that the mesa is a dot 33 as a protrusion with a recessed periphery 30. But, the periphery 30 is a portion outside of the mesa 33, and thus, the periphery 30 is not part of the mesa.

The dot mark of claim 1 of the present invention is, however, "made by one dot mark formed on each laser irradiated point", and having "a protrusion which protrudes in the center portion upward from the surface of the article to be marked". That is, according to claims 1 and 11 of the present invention, there exists a portion which does not protrude upward from the wafer surface within the dot mark and is outside of the protruded center portion. The mesa of Kruger, on the other hand, does not have a non-protruded portion, which is apparent from the method of forming the mesa. Since the mesa of Kruger is formed by etching the surrounding portion of the mesa, the mesa is a non-etching portion by itself, and is surrounded by the surface made by etching. Therefore, each one of the mesas is entirely a protrusion, so that there is no non-protruding portion in each of the mesas.

Thus, Kruger does not disclose or suggest a dot mark "made by one dot mark formed on each laser irradiated point" and having "a protrusion which protrudes in the center portion upward from the surface of the article to be marked".

Although the Office Action asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention that a similar microdot with the same dot size, shape and structure could be formed by a variety of means and have the same properties, Kruger does not disclose or suggest a structure of the dot mark according to claims 1 and 11 as mentioned above. Also, Kruger does not disclose or suggest a dot mark having the same properties as Applicants' mark, i.e., a dot mark with excellent visibility even by a single dot mark as compared to conventional marks.

Accordingly, claims 1 and 11 of this application are patentable over Kruger. Dependent claims 8-10 are also allowable at least for the reasons above regarding independent claim 1 and because of their dependency upon independent claim 1. Thus, Applicants submit that the § 103 rejection has been overcome.

Claims 1, 2, and 7-11

In Office Action paragraph 7, claims 1, 2, and 7-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ota et al. (U.S. 5,477,309) in view of Baumgart et al. (U.S. 6,205,002). Applicants respectfully disagree.

Ota et al. relates to an alignment apparatus for a wafer. The mark formed on the wafer for alignment is, however, a line. (Ota et al., Fig. 9), and the line is formed merely by a recess between the line marks, and a pitch between the line marks is 6 μm . Therefore, Ota et al. does not even disclose or suggest a dot mark, and thus, does not disclose or suggest the feature of claims 1 and 11 of this application.

Baumgart et al. relates to formation of bumps in a contact start stop (CSS) region of a magnetic disk in order to reduce stiction and friction between the magnetic disk and a read-write head. Therefore, Baumgart et al. does not disclose or suggest forming the bumps on a semiconductor wafer. The Baumgart et al. bumps are different from claims 1 and 11 of this application in terms of not only structure but also function, because the Baumgart et al. bumps do not have a shape that has excellent visibility even by a single bump.

Accordingly, neither Ota et al. nor Baumgart et al., alone or in combination, disclose the features of claims 1 and 11 as mentioned above, so and the advantageous effects of the present invention can not be expected from either of the references.

Therefore, claims 1 and 11 are patentable over Ota et al. in view of Baumgart et al. Dependent claims 7-10 are also patentable at least for the reasons above regarding independent claim 1 and by virtue of their dependency upon independent claim 1. Thus, Applicants submit that the § 103 rejection has been overcome.

CONCLUSION

For the foregoing reasons, Applicants submit that the patent application is in condition for allowance and request a Notice of Allowance be issued.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. (Three Times Amended) A microdot mark shape which is formed by a laser beam, on a surface of an article to be marked, which is a wafer, by using a laser as a light source, wherein

the microdot mark shape is made by one dot mark formed on each laser irradiated point,

the mark has a protrusion which protrudes in the center portion upward from the surface of the article to be marked, and

the length of each dot mark along the surface of the article to be marked is 1.0 to 15.0 μm .

11. (Amended) A microdot mark shape which is formed by a laser beam, on a surface of an article to be marked, which is a wafer, by using a laser as a light source, wherein

the microdot mark shape is made by one dot mark formed on each laser irradiated point,

the mark has a protrusion which protrudes in the center portion upward from the surface of the article to be marked,

the length of each dot mark along the surface of the article to be marked is 1.0 to 15.0 μm , and

the dot mark is formed for product management or various securities.